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Fischer-Tropsch Is Turning Kentucky's Coal and Biomass into Ultra Clean Fuels
Discovered by two German scientists in the 1920s, the Fischer-Tropsch (FT) process uses a catalyst (a reaction accelerator) to convert syngas to hydrocarbons. The hydrocarbons come out of the FT reactor as wax that is "cracked" (long molecules are chemically broken into shorter ones) to yield 20 percent low-quality gasoline and 80 percent high-quality diesel. FT diesel is cleaner than traditional petroleum diesel because nitrogen and sulfur are removed in the process, resulting in fewer undesirable emissions.

In the basement of the University of Kentucky Center for Applied Energy Research, Burt Davis shows off his Fischer-Tropsch reactors. "Our Fischer-Tropsch lab is the largest open-access, non-commercial Synfuel lab in the country," Fisher-Tropsch is a World War II-era process that makes liquid fuels from coal and natural gas.

High fuel costs, political uncertainty and recent advances in FT efficiency have once again brought this technology to the forefront. As announced by Congressmen Hal Rogers and Geoff Davis, The UK Center for Applied Energy Research recently received $1.46 million in U.S. Department of Energy funding to begin design and construction of an FT mini-refinery. This facility will allow CAER to convert syngas through the FT process, with a research focus on new products such as chemicals, increasing process efficiencies and reducing the overall carbon footprint of the process. The mini-refinery will be capable of producing 0.5 barrels a day of finished products, which will be supplied to other universities and the government for testing in a range of diesel and jet engines.

Carbon Sequestration Process Targeting Coal Emissions by Injecting CO2 Underground
More than 90 percent of Kentucky's electricity comes from coal, and more than 50 percent of the nation's electricity is coal based. But with an ever-increasing supply of CO2 from coal-fired power plants, the need to do something with CO2 other than vent it into the atmosphere is growing. The best solution to this problem may be right under our feet.

The Kentucky Geological Survey at UK is taking the next step in clean-coal research by drilling test wells to store CO2 in depleted oil and gas reservoirs, unmineable coal seams and saline reservoirs. In 2007 the Kentucky legislature passed House Bill 1, which allocated $5 million to KGS to drill saline reservoir test wells in western and eastern Kentucky, as well as test the potential to recover oil and gas from coal seams.

In Hancock County, in western Kentucky, $1.4 million from House Bill 1 and $5.45 million pledged from industry partners (Peabody, ConocoPhilips, TVA, E.ON US and others) will fund drilling for an 8,300-foot well. This well will allow researchers to test the CO2 storage potential of three types of porous rock: sandstone, dolomite and shale. KGS is still seeking industry partners for the well proposed in Boone Country in eastern Kentucky. CO2 injection and testing is expected to begin in 2009.

With funding from the Kentucky Energy and Environment Cabinet, KGS is also creating a "site bank" with information about the geologic sequestration potential beneath future locations for coal-fired power plants, Fischer-Tropsch or coal gasification plants.